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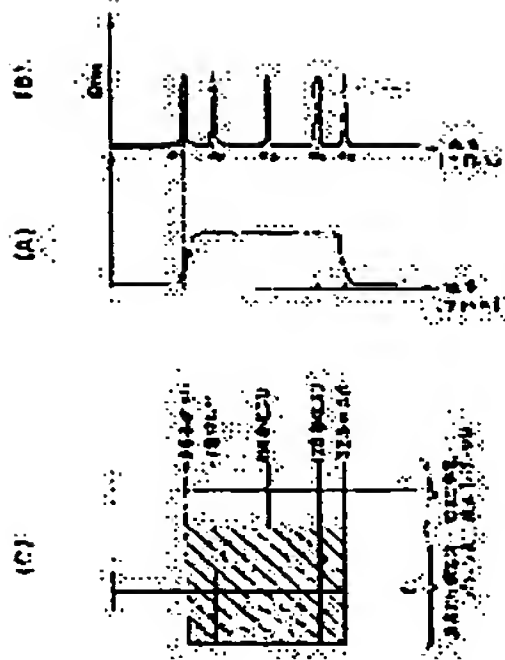
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(54) RECORDING APPARATUS HAVING CORRECTING FUNCTION FOR RECORDING DENSITY UNIFORMITY AND METHOD OF CORRECTING RECORDING DENSITY UNIFORMITY

(57)Abstract:

PURPOSE: To achieve the improvement of head shading by correctly performing the detection of recording density uniformity of a recording head and special fixation of the recording element position of the recording head, and also always accurately performing the correspondence between the recording element position and detecting density data

CONSTITUTION: A pattern B printed by driving a specific recording element is simultaneously formed in addition to a pattern A for detecting the recording density uniformity of a recording head, and by the use of both the patterns A and B, head shading is effected. Namely, the correspondence between the density data of the density uniformity detecting pattern A and each recording element is conducted in use of the address of the density data in the memory of the recording element position detecting pattern B accommodated in the memory.



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CLAIMS

[Claim(s)]

[Claim 1] In the recording device which has the record concentration unevenness amendment function which detects the concentration unevenness of the pattern formed by the recording head which arranged two or more record components, and amends the concentration data for every record component A means to print the pattern for concentration unevenness detection using said two or more record components. A means to relate with said pattern for concentration unevenness detection, and to print the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, A means to detect the concentration of said printed pattern for concentration unevenness detection, and said pattern for location detection. The memory means which carries out the temporary storage of the concentration data of said pattern for location detection obtained by said detection means. The recording device which has the record concentration unevenness amendment function characterized by having a means to make the concentration data and said each record component of said pattern for concentration unevenness detection correspond based on the address position of the pattern for location detection in which it was stored by said memory means.

[Claim 2] The recording device according to claim 1 characterized by having further a means to create concentration amendment data based on the concentration data corresponding to said each record component with said correspondence means.

[Claim 3] The recording device according to claim 2 characterized by having further a means to amend the image recorded by said recording head, according to the amendment data created by said creation means.

[Claim 4] Said recording head is a recording device according to claim 1 characterized by

carrying out the regurgitation of the ink with heat energy.

[Claim 5] Said specific record component used for printing of said pattern for location detection is a recording device according to claim 1 characterized by being plurality.

[Claim 6] Said specific record component is a recording device according to claim 5

characterized by being the record component of the both ends of said recording head.

[Claim 7] The process which prints the pattern for record concentration unevenness detection using all the record components of the recording head which arranged two or more record

components, The process which relates with said pattern for record concentration unevenness

detection, and prints the pattern for location detection of a record component using at least one specific record component selected from said two or more record components. The process

which reads said printed pattern for location detection, and stores the concentration data in memory. The process which makes the address of the specific record component of the

concentration data stored in said memory detect and memorize. The process which reads said printed pattern for concentration unevenness detection, and the concentration data and said

each record component of said pattern for concentration unevenness detection The record concentration unevenness amendment approach characterized by having the process to which it

is made to correspond based on the address position of the specific record component of the

pattern for location detection stored in said memory means.

[Claim 8] The record concentration unevenness amendment approach according to claim 7 characterized by having further the process which creates concentration amendment data based on the concentration data corresponding to said each record component according to said correspondence process.

[Claim 9] The record concentration unevenness amendment approach according to claim 8

characterized by having further a means to amend the image recorded by said recording head,

according to the amendment data created by said creation means.

[Claim 10] Said recording head is the record concentration unevenness amendment approach

according to claim 7 characterized by carrying out the regurgitation of the ink with heat energy.

[Claim 11] Said specific record component used for printing of said pattern for location detection is the record concentration unevenness amendment approach according to claim 7 characterized by being plurality.

[Claim 12] Said specific record component is the record concentration unevenness amendment approach according to claim 11 characterized by being the record component of the both ends of said recording head.

[Claim 13] The pattern creation approach for record concentration unevenness amendment of having the process which prints the pattern for record concentration unevenness detection, and

the process which relate with said pattern for concentration unevenness detection, and print the pattern of a record component for location detection using at least one specific record

component selected from two or more of said record components using all the record

components of the recording head which arranged two or more record components.

[Claim 14] Said specific record component used for printing of said pattern for location detection is the pattern creation approach for record concentration unevenness amendment according to

claim 13 characterized by being plurality.

[Claim 15] Said specific record component is the pattern creation approach for record concentration unevenness amendment according to claim 13 characterized by being the record component of the both ends of said recording head.

[Claim 16] Said specific record component is the pattern creation approach for record

concentration unevenness amendment according to claim 15 characterized by having the center of said recording head further.

[Claim 17] The process which reads the pattern for location detection of the record component created using at least one specific record component of a recording head, and stores the

concentration data in memory. The process which makes the address of the specific record

component of the concentration data stored in said memory detect and memorize. The process which reads the pattern for concentration unevenness detection created using all the record

components of a recording head. The record concentration unevenness amendment data

origination approach characterized by having the process which makes the concentration data

and said each record component of said pattern for concentration unevenness detection

correspond based on the address position of the specific record component of the pattern for

location detection in which it was stored by said memory.

[Claim 18] Said specific record component used for printing of said pattern for location detection is the record concentration unevenness amendment data origination approach according to claim

17 characterized by being one.

[Claim 19] Said specific record component used for printing of said pattern for location detection is the record concentration unevenness amendment data origination approach according to claim

17 characterized by being plurality.

[Claim 20] Said specific record component is the record concentration unevenness amendment data origination approach according to claim 17 characterized by being the record component of

the both ends of said recording head.

[Claim 21] Said specific record component is the record concentration unevenness amendment data origination approach according to claim 20 characterized by having the record component

of the center of said recording head further.

[Claim 22] In the recording device which has the record concentration unevenness amendment function which detects the concentration unevenness of the pattern formed by the recording

head which arranged two or more record components, and amends the concentration data for every record component A means to print the pattern for concentration unevenness detection using said two or more record components, A means to relate with said pattern for concentration unevenness detection, and to print the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, A means to detect the concentration of said printed pattern for concentration unevenness detection, and a means to recognize the location of said specific record component based on said printed pattern for location detection, The recording device which has the record concentration unevenness amendment function characterized by having the means to which the concentration data and said each record component of said pattern for concentration unevenness detection are made to correspond based on the location of said recognized specific record component.

[Claim 23] The recording device according to claim 22 characterized by having further a means to create concentration amendment data based on the concentration data corresponding to said each record component with said correspondence means.

[Claim 24] The recording device according to claim 23 characterized by having further a means to amend the image recorded by said recording head, according to the amendment data created by said creation means.

[Claim 25] Said recording head is a recording device according to claim 22 characterized by carrying out the regurgitation of the ink with heat energy.

[Claim 26] Said specific record component used for printing of said pattern for location detection is a recording device according to claim 22 characterized by being plurality.

[Claim 27] Said specific record component is a recording device according to claim 26 characterized by being the record component of the both ends of said recording head.

[Claim 28] In the record concentration unevenness amendment approach which detects the concentration unevenness of the pattern formed by the recording head which arranged two or more record components, and amends the concentration data for every record component The process which prints the pattern for concentration unevenness detection using said two or more record components, The process which relates with said pattern for concentration unevenness detection, and prints the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, The process which detects the concentration of said printed pattern for concentration unevenness detection, and the process which recognizes the location of said specific record component based on said printed pattern for location detection, The record concentration unevenness amendment approach characterized by having the process which corresponds the concentration data and said each record component of said pattern for concentration unevenness detection based on the location of said recognized specific record component.

[Claim 29] The record concentration unevenness amendment approach according to claim 28 characterized by having further the process which creates concentration amendment data based on the concentration data corresponding to said each record component according to said correspondence process.

[Claim 30] The record concentration unevenness amendment approach according to claim 29 characterized by having further the process which amends the image recorded by said recording head according to the amendment data created by said creation process.

[Claim 31] Said specific record component used for printing of said pattern for location detection is the record concentration unevenness amendment approach according to claim 28 characterized by being one.

[Claim 32] Said specific record component used for printing of said pattern for location detection is the record concentration unevenness amendment approach according to claim 28 characterized by being plurality.

[Claim 33] Said specific record component is the record concentration unevenness amendment approach according to claim 32 characterized by being the record component of the both ends of said recording head.

[Claim 34] Said specific record component is the record concentration unevenness amendment

approach according to claim 33 characterized by having the record component of the center of said recording head further.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is a thing about the recording device which performs image formation (record) using the recording head which comes to arrange two or more record components. In more detail By detecting the concentration unevenness of the pattern recorded by the recording head, specifying the concentration data for every record component of a recording head, and controlling the output of each record component based on these data It is related with the amendment approach of the recording device which has the function (this amendment is called head shading-head-shading) which amends the unevenness of record concentration, and concentration unevenness.

[0002]

[Description of the Prior Art] The equipment which performs digital image recording using information management systems, such as a reproducing unit, and a word processor, a computer, and the recording head according to an ink jet method, a hot printing method, etc. as image formation (record) equipment of these devices further in connection with the spread of communication equipment has spread quickly. In such a recording device, it is common to use the recording head which comes to carry out the accumulation array of two or more record components because of improvement in a recording rate.

[0003] For example, in an ink jet recording head, the so-called multi-nozzle head which accumulated two or more ink deliveries and liquid routes is common, and even the thermal head of a hot printing method and a sensible-heat method of two or more heaters being accumulated is common.

[0004] In such a recording head, it is difficult to originate in dispersion in a property, property dispersion of a head component, etc. by the manufacture process, and to manufacture a property for two or more of the record components to homogeneity. Consequently, in this recording head, a certain amount of dispersion arises in the property of each of that record component. For example, in an ink jet recording head, dispersion arises in the configuration of a delivery, a liquid route, etc., and dispersion arises in the configuration of a heater, or resistance in a thermal head. Moreover, in addition to the cause of the limitation of such a manufacturing technology, dispersion arises in the property between each record component of a recording head also according to secular change. The uniformity of the property between each record component in such a recording head turns into the magnitude of a dot and the uniformity of concentration which are recorded by each record component, and will appear, and concentration unevenness will produce it in a record image as a result.

[0005] Since dispersion in the property of each record component in such a recording head (for example, it is equivalent to the unevenness of ink discharge quantity in an ink jet recording head) spoils the quality of a record image remarkably, the attempt which amends dispersion in such a property conventionally is made.

[0006] The recording device of the following configurations is proposed as such an attempt. That is, it is equipment of a configuration of preparing the read station of a record pattern in a recording device, reading the concentration unevenness in the record component array range

periodically, and creating concentration unevenness amendment data from this concentration unevenness data.

[0007] As a recording apparatus, an ink jet recording apparatus is taken for an example, and such a concentration unevenness amendment approach is explained. The recording head of this ink jet recording device is a head of the format which forms air bubbles in the ink in a delivery by generation of heat of the thermoelectricity sensing element attached in the interior of two or more deliveries, and carries out the regurgitation of the ink droplet with this cellular developed pressure. This head has some which were constituted possible [a scan of the range corresponding to the die length (297mm) of the shorter side of the record medium of for example, A3 size], and 128 deliveries are arranged in the direction which is the consistency of 400dpi (dot par inch), and intersects perpendicularly with this head with the direction of said scan. As for the case of a color, four heads of this configuration are used, and these four heads are a cyanogen head, a Magenta head, a yellow head, and a black head.

[0008] It is the requisite that the record concentration data read by each ink delivery and the reading system in order to amend such regurgitation unevenness (concentration unevenness) for every ink delivery of a recording head for every ink delivery are matched surely.

[0009] In the conventional example, each delivery of a recording head is first driven by the uniform predetermined record signal, and as shown in drawing 1 , the test pattern 2 for concentration unevenness detection is formed on a record medium 1. This test pattern 2 is formed for every color, the head with which two or more deliveries were compared by the single tier shows this test pattern 2 to the left-hand side of drawing 2 -- as -- the printing direction -- the right from the left -- upper case 2a and the middle -- it forms by printing three lines of 2b and lower-berth 2c. The formation approach of this pattern 2 is called irregular three-line printing, and when the number of deliveries is [for example,] 128, first, from the delivery to the 128th [last] in the 96th, 1st Rhine 2a makes ink breathe out, and is printed. Next, in 2nd Rhine 2b, from the 1st to all the 128th deliveries, ink is made to breathe out and it prints. In the last Rhine 2c [3rd], the 32nd delivery to ink is made to breathe out from the 1st latest delivery, and it prints.

[0010] Thus, conventionally, it surrounds by the 1st Rhine 2a and 3rd Rhine 2c which drove two or more deliveries of each edge of a head, and printed 2nd Rhine 2b which drove and printed all the deliveries of a head, and the test pattern 2 is formed. When a test pattern consists of only the 2nd Rhine 2b, the both ends of the concentration data of the reading do not show the standup of the concentration which clarified by reflection from the blank paper part near the both ends of a pattern etc., but stop easily being able to decide the edge location of a head from the concentration data. Formation of the test pattern by said irregular three-line printing avoids this fault.

[0011] Next, it stores in the memory in equipment temporarily at the order which read the concentration distribution data which were formed as mentioned above, and which read in the reading starting position S, read the test pattern 2 of a certain color by the image reading system in the direction of arrow-head Y, and read it to the termination location F as shown in the left-hand side of drawing 2 .

[0012] by the way -- this conventional recording apparatus -- the recording density of an ink jet recording system, and reading of an image reading system -- resolving power -- for example, 400dpi (dot par inch) -- as -- it is made the same. Therefore, the dot of the ink breathed out from each ink delivery corresponds to 1 pixel of a reading system. Furthermore, if the concentration data on said memory are expressed with 256 gradation, one delivery will be made equivalent to the 1-byte field on memory, and the printing concentration by the delivery can be expressed. It is because 1 byte consists of binary [of 8 bits] and the number of combination is set to 28= 256 as everyone knows. Therefore, if a threshold DTH is set up appropriately, the section (byte count) of the concentration data exceeding this threshold will be in agreement at the regurgitation section of the reading direction of a test pattern.

[0013] X1 -X2 in the graph on the right-hand side of drawing 2 The section turns into the section of the above-mentioned test pattern. X1 X2 Since it is obtained as address information on memory, the storing address of the concentration data of a No. 1 delivery to a No. 128

delivery is called for by address computation, and the amount of concentration unevenness amendments can be calculated with this concentration data.

[0014]

[Problem(s) to be Solved by the Invention] However, X1 [in / at the above conventional examples / drawing 2] X2 It is necessary to choose the level of a threshold (DTH) as asking proper. Especially the test pattern printed in the ink of yellow has the low concentration read by the reading system compared with other colors, and depending on how to define a threshold (DTH), as shown in drawing 2, it will be detected as the section of X3 -X4 (when threshold level is DTH1). Therefore, in the conventional recording apparatus, there is a fault that

correspondence of an ink delivery and concentration data is not performed correctly.

[0015] Then, the technical problem of this invention can pinpoint the location of the ink delivery corresponding to it correctly to the detected concentration unevenness in view of an above-mentioned point, and is to offer the recording device and the record concentration unevenness amendment approach this aimed at improvement in the engine performance of a head shading compensation (head-shading).

[0016]

[Means for Solving the Problem] The recording device of this invention which has the record concentration unevenness amendment function which detects the concentration unevenness of the pattern formed by the recording head which arranged two or more record components, and amends the concentration data for every record component A means to print the pattern for concentration unevenness detection using said two or more record components, A means to relate with said pattern for concentration unevenness detection, and to print the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, A means to detect the concentration of said printed pattern for concentration unevenness detection, and said pattern for location detection. The memory means which carries out the temporary storage of the concentration data of said pattern for location detection obtained by said detection means, It is characterized by having a means to make the concentration data and said each record component of said pattern for concentration unevenness detection correspond based on the address position of the pattern for location detection in which it was stored by said memory means.

[0017] Moreover, the process at which the record concentration unevenness amendment approach of this invention prints the pattern for record concentration unevenness detection using all the record components of the recording head which arranged two or more record components, The process which relates with said pattern for concentration unevenness detection, and prints the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, The process which reads said printed pattern for location detection, and stores the concentration data in memory. The process which makes the address of the specific record component of the concentration data stored in said memory detect and memorize, It is characterized by having a process [/ based on the address position of the specific record component of the pattern for location detection in which the process which reads said printed pattern for concentration unevenness detection, and the concentration data and said each record component of said pattern for concentration unevenness detection were stored by said memory means].

[0018] Moreover, the pattern creation approach for record concentration unevenness amendment of this invention The process which prints the pattern for record concentration unevenness detection using all the record components of the recording head which arranged two or more record components, It is characterized by relating with said pattern for concentration unevenness detection, and having the process which prints the pattern for location detection of a record component using at least one specific record component selected from said two or more record components.

[0019] Moreover, the record concentration unevenness amendment data origination approach of this invention The process which reads the pattern for record component location detection created using at least one specific record component of a recording head, and stores the concentration data in memory. The process which makes the address of the specific record

component of the concentration data stored in said memory detect and memorize. The process which reads the pattern for concentration unevenness detection created using all the record components of a recording head, It is characterized by having the process which makes the concentration data and said each record component of said pattern for concentration unevenness detection correspond based on the address position of the specific record component of the pattern for location detection in which it was stored by said memory. [0020] Furthermore, other recording devices which have the record concentration unevenness amendment function of this invention A means to print the pattern for concentration unevenness detection using said two or more record components, A means to relate with said pattern for concentration unevenness detection, and to print the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, A means to detect the concentration of said printed pattern for concentration unevenness detection, and a means to recognize the location of said specific record component based on said printed pattern for location detection, It is characterized by having the means to which the concentration data and said each record component of said pattern for concentration unevenness detection are made to correspond based on the location of said recognized specific record component.

[0021] Moreover, the record concentration unevenness amendment approach of this invention which detects the concentration unevenness of the pattern formed by the recording head which arranged two or more record components, and amends the concentration data for every record component The process which prints the pattern for concentration unevenness detection using said two or more record components, The process which relates with said pattern for concentration unevenness detection, and prints the pattern for location detection of a record component using at least one specific record component selected from said two or more record components, The process which detects the concentration of said printed pattern for concentration unevenness detection, and the process which recognizes the location of said specific record component based on said printed pattern for location detection, It is characterized by having the process which corresponds the concentration data and said each record component of said pattern for concentration unevenness detection based on the location of said recognized specific record component.

[0022] Here, said recording apparatus may have further a means to create concentration amendment data based on the concentration data corresponding to said each record component with said correspondence means.

[0023] Furthermore, said recording apparatus may have further a means to amend the image recorded by said recording head, according to the amendment data created by said creation means.

[0024] Moreover, the head which records by different color is sufficient as said recording head. [0025] Moreover, the head which carries out the regurgitation of the ink is sufficient as said recording head, and the thing of the gestalt which carries out the regurgitation of the ink with heat energy is sufficient as it further.

[0026] Furthermore, the head which records with a serial scan is sufficient as said recording head.

[0027] Moreover, a multiple-times scan may be carried out by said recording head, and said pattern for concentration unevenness detection may be formed.

[0028] Moreover, said recording head may have width of face equal to the width of face of a record medium.

[0029] Furthermore, the number of said specific record components used for printing of said pattern for location detection may be one.

[0030] Said specific record component used for printing of this pattern for location detection may be plural.

[0031] This specific record component may be a record component of the both ends of said recording head, and may have the record component of the center of said recording head further.

[0032]

[Function] The concentration data of the test pattern for concentration unevenness detection printed in this invention using all the record components of a recording head, Face carrying out matching with each record component of a head, relate with the test pattern for concentration unevenness detection, make only a specific record component drive further, and the test pattern for record component location specification is printed. This test pattern for record component location specification is read by the reading system, and that concentration data is stored in memory, then said test pattern for concentration unevenness detection is read. That concentration distribution data, From the address on the memory in which the concentration data of said test pattern for delivery location specification were stored, matching with each record component and the concentration data of the test pattern for concentration unevenness detection is performed. Therefore, thereby, specification with concentration unevenness detection and a record component location can be performed correctly.

[0033]

[Example] Hereafter, the example of this invention is explained to a detail with reference to a drawing.

[0034] Drawing 3 shows the example of a configuration of the recording head of the ink jet recording device which applied this invention. In this Fig., 20 is the ink jet head (recording head) of the method which carries out the regurgitation of the ink to the detail paper using the air bubbles generated with heat energy, and this head 20 is attached in the ink tank 10 at one. The head 20 and the ink tank 10 which were these-unified constitute the ink jet head cartridge 21, and this cartridge 21 is attached in a recording device free [attachment and detachment]. [0035] In the ink jet head cartridge 21 in this example, the point of the ink jet head 20 has projected more slightly than the front face of the ink tank 10 so that it may understand with the perspective view of drawing 3. This cartridge 21 is an exchangeable type thing, and is constituted by that fixed support of the attachment and detachment on the carriage currently laid in the body IJRA of an ink jet recording apparatus mentioned later will be enabled. The ink tank 10 which stored the ink supplied to the ink jet head 20 consists of an ink absorber, a container for inserting this ink absorber, and covering device material (all are un-illustrating) that closes this. It fills up with ink in this ink tank 10, and ink is supplied to a head 20 side one by one according to the regurgitation of the ink from a head 20.

[0036] The ink jet head cartridge 21 constituted as mentioned above is carried in the carriage of the ink jet recording apparatus IJRA explained below free [attachment and detachment] by the predetermined approach, relative migration with carriage and a recorded member is controlled by the input of a predetermined record signal, and a desired record image is formed.

[0037] Drawing 4 is the appearance perspective view showing an example of the ink jet recording device IJRA equipped with the device for the above-mentioned head shading processing.

[0038] In this Fig., 16 is the carriage holding said recording head 20. This carriage 16 is attached in two guide shafts 19A and 19B each other arranged in parallel free [sliding] while it is connected with some driving belts 18 which transmit the driving force of a drive motor 17. Consequently, the recording head 20 has come to be able to carry out both-way migration free covering full [of the recording paper]. A recording head 20 records the image according to received data in the record paper during the both-way migration. Specified quantity conveyance of the recording paper is carried out in the direction which intersects perpendicularly with said horizontal scanning for every 1 scan (horizontal scanning) termination for record of this head 20 (vertical scanning is performed).

[0039] 26 is a head recovery device and this head recovery device 26 is arranged in the location which counters the end of the moving trucking of a recording head 20 with a home position. This head recovery device 26 is driven through a driving mechanism 23 by the motor 22, and performs capping of a recording head 20. This head recovery device 26 has cap section 26A, makes said recording head 20 attach this cap section 26A, and performs suction actuation (suction recovery) with the proper suction means (for example, suction pump) established in the head recovery device 26. Ink can be made to be able to discharge compulsorily from each delivery of a head 20 by this suction actuation, affixes, such as thickening ink which existed in each delivery of a head 20 by this, and surrounding dust of each delivery, can be removed, and regurgitation

recovery is realized. Moreover, when [after record termination etc.] not performing record actuation comparatively at a long period of time, a recording head 20 can be protected from desiccation, adhesion of dust, etc. by performing capping to a head 20 by said cap section 26A. Such regurgitation recovery is performed, a power up, the time of recording head exchange, or when record actuation is not performed beyond fixed time amount.

[0040] 31 is a blade as a wiping member which is arranged in the side face of the head recovery device 26, and is formed by silicone rubber. This blade 31 is held with the cantilever gestalt at blade attachment component 31A, like the head recovery device 26, operates according to a motor 22 and a driving mechanism 23, and ****s to the regurgitation side of a recording head 20. therefore, the time of record actuation of a recording head 20, and after the regurgitation recovery using the head recovery device 26, by making a blade 31 project in the moving trucking of a recording head 20, a blade 31 scrapes the regurgitation side of the head 20 under migration, and has adhered to the regurgitation side to suitable timing -- it dewes, and it gets wet or affixes, such as dust, can be wiped off.

[0041] In addition, although drawing 4 showed the monochromatic recording apparatus with which one ink jet head cartridge 21 was attached for simplification of explanation, in the case of a multicolor color recording apparatus, cyanogen, a Magenta, yellow, and four ink jet head cartridges of black are only attached in carriage, and, fundamentally, it is the same structure. [0042] Drawing 5 shows the example of circuitry of the reading system of an ink jet recording device, and a recording system which applied this invention. A signal for the Records Department 100 to do heating adjustment of a recording head 20 and this head 20 here at fixed temperature. The head driver 110 which supplies a regurgitation pulse to the heating medium in each delivery in order to make ink breathe out, It consists of printing / a temperature-control control section 120 which adjusts the pulse width of the temperature-control signal outputted from the head driver 110 so that the temperature information from the temperature sensor in a recording head 20 (un-illustrating) may be acquired and a head 20 may be maintained to predetermined temperature, and a regurgitation pulse. The printing section is controlled by the control section 120 for every printing color.

[0043] The image data inputted into the Records Department 100 is a binary-sized signal which shows whether the regurgitation of the ink is carried out for every ink delivery. When the image data made binary is inputted into the head driver 110 controlled by said printing / temperature-control control section 120, ink will carry out the regurgitation from each delivery of the corresponding recording head 20. Moreover, the thing by the image entry of data made to breathe out ink from a delivery ** is also possible, and from the head driver 110, to a specific delivery, it is adding for a long time, and can carry out the heating pulse used for a temperature control rather than the time of the usual temperature control by the control section 120. Printing of the test pattern for delivery location detection (a chart is called) mentioned above is performed using this regurgitation approach. That is, as ink is made to breathe out only from the specific delivery of a head 20 and it is shown in drawing 6 mentioned later with the driving signal of printing / temperature-control control section 120 of the Records Department 100, the linear chart B for delivery location detection shown in the right-hand side of each concentration unevenness detection pattern A is printed. Printing of the pattern A for concentration unevenness detection is performed to the gamma transducer 270 of the image-processing section 200 by inputting cyanogen, a Magenta, yellow, and the fixed value (80H) 250 of black, and is made to record on it as a pattern of a halftone.

[0044] An example of the test pattern for head shading used by this invention formed in drawing 6 at the detail paper 1 is shown. This chart consists of four every patterns and a total of 16 patterns about each color of cyanogen, a Magenta, yellow, and black. And each pattern has composition shown in the left-hand side of drawing 7. That is, it consists of a pattern B for delivery location detection which breathed out and printed ink from the delivery of No. 96 of the test pattern A for concentration unevenness detection which breathed out and printed ink from all the deliveries of a recording head 20 like the conventional example, and a recording head 20, No. 1, No. 64, No. 128, and No. 32. In addition, both these patterns A and B are formed of the above mentioned irregular three-line print processes.

[0045] Next, how to perform matching with each delivery and the concentration data of the read test pattern A for concentration unevenness detection from the test pattern A for concentration unevenness detection and the test pattern B for delivery location detection which are the main point of this invention is explained. In addition, since other parts of head shading processings other than this matching are also not main parts but the well-known techniques of this invention, that explanation is omitted.

[0046] In drawing 7, it reads with the image sensors (charge-coupled device) 210 which showed the pattern B for delivery location detection located in the right-hand side of Pattern A to drawing 5. The relation between the level of this read concentration data and the address of memory 240 is shown in the graph on the right-hand side of drawing 7 (B). Since the pattern B for delivery location detection is printed using five deliveries as described above, the peak of a wave [data / which were read by the sensor 210 / concentration] comes to show five configurations.

[0047] As shown in the graph (B) of drawing 7, the concentration data which read the pattern B for delivery location detection, and were stored on memory 240 are searched from the direction of the lower order of the address on the memory 240, and it goes. And predetermined threshold level DTH3 Memory 240 is made to memorize the address with which the concentration data to exceed are stored further. Thus, the addresses a1-a5 made to memorize correspond to the concentration data of a No. 96 delivery, a No. 1 delivery, a No. 64 delivery, a No. 128 delivery, and a No. 32 delivery sequentially from lower order.

[0048] Next, the concentration data of the same address as the address a2 of said No. 1 delivery already memorized among the concentration data which read the pattern A for concentration unevenness detection in image sensors 210, and were stored on memory 240 are adopted as concentration data of the No. 1 delivery of the pattern A for concentration unevenness detection.

[0049] Since said pattern B for delivery location detection is formed, controls directly the not a halftone but head driver 110 of concentration 50% like the pattern A for concentration unevenness detection and is moreover made to breathe out, its regurgitation concentration is comparatively high and its printing concentration is high, without being influenced of the regurgitation ink of the delivery which approached, since it is what was made to breathe out only a specific delivery and was formed. Therefore, to the concentration data of Pattern B, the threshold for identifying a peak location, i.e., a delivery location, can be set up highly, the inclination part of concentration data can be avoided, and pinpointing of an exact location is attained.

[0050] Moreover, by Pattern B, since five deliveries are used, even if which delivery is the non-regurgitation, it can ask for the address with which the data of a No. 1 delivery are stored by count easily from the address with which the concentration data of the remaining deliveries are stored, and the ink non-regurgitation can also be coped with. In addition, if the non-regurgitation of a specific delivery is not taken into consideration, considering at least one delivery as a specific delivery, then a pattern for delivery location detection, it is enough. After matching in the above-mentioned head shading processing is completed, the data for unevenness amendment (HS data) are calculated, and head shading processing is completed. Then, based on calculated HS data, image information or a driving signal is amended and an image without concentration unevenness is recorded.

[0051] Next, the detail of the head shading processing mentioned above is explained with reference to the flow chart of drawing 8 -11, and the graph of drawing 12.

[0052] Drawing 8 is the general flow chart of head shading. The test pattern for concentration unevenness detection and the pattern for delivery location detection which makes the description of this example are printed by Step1. In Step2, the printed pattern is read, matching with concentration data and a delivery is performed, and HS data are calculated by Step3. Then, in the usual record actuation, the image which abolished concentration unevenness based on the above-mentioned HS data is recorded by the recording head.

[0053] Drawing 9 is the flow chart of the pattern printing routine which shows the detail of Step1. The pattern for concentration unevenness detection (drawing 6, drawing 7, drawing 12)

is printed by Step11, and the pattern for delivery location detection (drawing 6, drawing 7, drawing 12) is printed by Step12. In Step 13 and 14, the pattern printing shown in drawing 6 is completed by repeating these by four classification by color and 4 pattern.

[0054] Drawing 10 is the flow chart of the pattern reading routine which shows the detail of Step2. In Step21, the pattern B for delivery location detection (drawing 12 (1)) is read, and it stores in memory as concentration data (drawing 12 (2), (3)). By Step22, this processing is repeated by four patterns. As mentioned above, concentration data show five peaks corresponding to a specific delivery.

[0055] The address on the memory of a specific delivery is searched with Step 23 and 24 by four patterns, and the detected address is stored in memory by Step25 at it (drawing 12 (4)). A specific delivery is detected as the address with which the concentration data exceeding a threshold DTH are stored.

[0056] Next, the pattern A for concentration unevenness detection is read by four patterns by Step 26 and 27, and it stores in memory (drawing 12 (5)). By Step28, the above processing is repeated by four colors, and is read, and a routine is ended.

[0057] Drawing 11 is the flow chart of HS data operation routine which shows the detail of Step3. From the address on the memory of the specific delivery stored by Step25, by Step26, the pattern for concentration unevenness detection is read and the service area on the memory of the stored data is determined at Step31 (drawing 12 (6)). Thereby, matching with concentration data and each delivery is made.

[0058] In Step32, HS data are calculated using the concentration data of the pattern for concentration unevenness detection of a service area. The above-mentioned processing is repeated by four patterns and 4 color by Step 33 and 34, and an operation routine is ended.

Here, although HS data for four patterns are calculated per color, as HS data used for concentration unevenness amendment, these may be averaged and the mode may be used.

[0059] According to above-mentioned head shading processing, since correspondence with the concentration data of the pattern for concentration unevenness detection and each delivery is performed correctly, suitable concentration unevenness amendment data (HS data) can be calculated. Consequently, it becomes possible to record an image without concentration unevenness.

[0060] In addition, this invention is not limited to ink jet record, and can be applied to thermal transfer recording, thermal recording, etc.

[0061] (in addition to this) In addition, especially this invention is equipped with means (for example, an electric thermal-conversion object, a laser beam, etc.) to generate heat energy as energy used also in an ink jet recording method in order to make the ink regurgitation perform, and brings about the effectiveness which was excellent in the recording head of the method which makes the change of state of ink occur with said heat energy, and the recording device. It is because the densification of record and highly minute-ization can be attained according to this method.

[0062] About the typical configuration and typical principle, what is performed using the fundamental principle currently indicated by the U.S. Pat. No. 4723129 specification and the 4740796 specification, for example is desirable. Although this method is applicable to both the so-called mold on demand and a continuous system On the electric thermal-conversion object which is especially arranged corresponding to the sheet and liquid route where the liquid (ink) is held in the case of the mold on demand By impressing at least one driving signal which gives the rapid temperature rise which supports recording information and exceeds nucleate boiling Since make an electric thermal-conversion object generate heat energy, the heat operating surface of a recording head is made to produce film boiling and the air bubbles in the liquid (ink)

corresponding to this driving signal can be formed by one to one as a result, it is effective. A liquid (ink) is made to breathe out through opening for regurgitation by growth of these air bubbles, and contraction, and at least one drop is formed. If this driving signal is made into the shape of a pulse form, since growth contraction of air bubbles will be performed appropriately instantly, the regurgitation of a liquid (ink) excellent in especially responsibility can be attained, and it is more desirable. As a driving signal of the shape of this pulse form, what is indicated by

the U.S. Pat. No. 4463359 specification and the 4345262 specification is suitable. In addition, if the conditions indicated by the U.S. Pat. No. 4313124 specification of invention about the rate of a temperature rise of the above-mentioned heat operating surface are adopted, further excellent record can be performed.

[0063] As a configuration of a recording head, the configuration using the U.S. Pat. No. 4558333 specification and U.S. Pat. No. 4459600 specification which indicate the configuration arranged to the field to which the heat operation section other than the combination configuration (a straight-line-like liquid flow channel or right-angle liquid flow channel) of a delivery which is indicated by each above-mentioned specification, a liquid route, and an electric thermal-conversion object is crooked is also included in this invention. In addition, the effectiveness of this invention is effective also as a configuration based on JP.59-138461,A which indicates the configuration whose puncturing which absorbs the pressure wave of JP.59-123670,A which indicates the configuration which uses a common slit as the discharge part of an electric thermal-conversion object to two or more electric thermal-conversion objects, or heat energy is made to correspond to a discharge part. Namely, no matter the gestalt of a recording head may be what thing, it is because it can record now efficiently certainly according to this invention. [0064] Furthermore, this invention is effectively applicable also to the recording head of the full line type which has the die length corresponding to the maximum width of the record medium which can record a recording device. As such a recording head, any of the configuration which fills the die length with the combination of two or more recording heads, and the configuration as one recording head formed in one are sufficient.

[0065] In addition, this invention is effective also when the thing of a serial type like an upper example also uses the recording head fixed to the body of equipment, the recording head exchangeable chip type to which the electric connection with the body of equipment and supply of the ink from the body of equipment are attained by the body of equipment being equipped, or the recording head of the cartridge type with which the ink tank was formed in the recording head itself in one.

[0066] Moreover, as a configuration of the recording device of this invention, since the effectiveness of this invention can be stabilized further, it is desirable to add the regurgitation recovery means of a recording head, a preliminary auxiliary means, etc. If these are mentioned concretely, a preheating means to heat using the capping means, the cleaning means, the pressurization or the suction means, the electric thermal-conversion object, the heating elements different from this, or such combination over a recording head, and a reserve regurgitation means to perform the regurgitation different from record can be mentioned. [0067] Moreover, although only one piece was prepared also about the class thru/or the number of a recording head carried, for example corresponding to monochromatic ink, corresponding to two or more ink which differs in an others and record color or concentration, more than one may be prepared the number of pieces. That is, although not only the recording mode of only mainstream colors, such as black, but an account head may be constituted in one as a recording mode of a recording device or the paddle gap by two or more combination is sufficient, for example, this invention is very effective also in equipment equipped with at least one of each of the full color recording mode by the double color color of a different color, or color mixture. [0068] Furthermore, in addition, in this invention example explained above, although ink is explained as a liquid It is ink solidified less than [a room temperature or it], and what is softened or liquefied at a room temperature may be used. Or by the ink jet method, since what carries out temperature control is common as a temperature control is performed for ink itself within the limits of 30 degrees C or more 70 degrees C or less and it is in the stabilization regurgitation range about the viscosity of ink, ink may use what makes the shape of liquid at the time of use record signal grant. In addition, in order to prevent the temperature up by heat energy positively because you make it use it as energy of the change of state from a solid condition to the liquid condition of ink, or in order to prevent evaporation of ink, the ink which solidifies in the state of neglect and is liquefied with heating may be used. Anyway, ink liquefies by grant according to the record signal of heat energy, and this invention can be applied also when using the ink of the property which will not be liquefied without grant of heat energy, such

as that by which liquefied ink is breathed out, and a thing which it already begins to solidify when reaching a record medium. The ink in such a case is good for a porosity sheet crevice or a through tube which is indicated by JP.54-56847,A or JP.60-71260,A also as liquefied or a gestalt which counters to an electric thermal-conversion object in the condition of having been held as a solid. In this invention, the most effective thing performs the film-boiling method mentioned above to each ink mentioned above.

[0069] Furthermore, in addition, as a gestalt of this invention ink jet recording device, although used as an image printing terminal of information management systems, such as a computer, the gestalt of the reproducing unit combined with others, a reader, etc. and the facsimile apparatus which has a transceiver function further may be taken.

[0070]

[Effect of the Invention] As explained above, according to this invention, the pattern of dedication for specification of the record component location of a recording head is printed. The address on the memory in which the concentration data which read and obtained this printed pattern were stored is memorized. Next, since it was made to make it correspond by using the address which memorized previously the record component number of the concentration data which read and obtained the pattern for concentration unevenness detection, pinpointing of concentration unevenness detection and a record component location can carry out correctly. Therefore, according to this invention, the engine performance of head shading is raised and the effectiveness that the convergence of the amendment can be raised is acquired.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the test chart which printed the pattern for concentration unevenness detection of the conventional example.

[Drawing 2] It is the graph which shows the relation between the explanatory view showing the reading direction of the pattern for detection of drawing 1 , and the level of the read concentration data and the address on memory.

[Drawing 3] It is the perspective view showing the example of a configuration of the recording head of the ink jet recording device which applied this invention.

[Drawing 4] It is the perspective view showing the example of an internal configuration of the important section of the ink jet recording device equipped with the recording head of drawing 3 .

[Drawing 5] It is the block diagram showing the example of circuitry of the reading system of an ink jet recording apparatus, and a recording system which applied this invention.

[Drawing 6] It is the test chart which printed the pattern for concentration unevenness detection of one example of this invention, and the pattern for delivery location detection.

[Drawing 7] It is the graph (A) and (B) which show the relation between the level of the concentration data of the top view (C) showing the reading direction of the pattern for detection of drawing 6 , and the read concentration unevenness pattern and the read level of the concentration data of a delivery location pattern, and the address on memory, respectively.

[Drawing 8] It is the outline flowchart of head shading performed by this invention.

[Drawing 9] It is the flow chart which shows the test pattern printing routine in head shading performed by this invention.

[Drawing 10] It is the flow chart which shows the test pattern reading routine in head shading performed by this invention.

[Drawing 11] It is the flow chart which shows the routine which creates amendment data from the test pattern reading concentration data in head shading performed by this invention.

[Drawing 12] It is a graph explaining the principle of this invention, and is the graph which shows the physical location of the pattern / pattern for concentration unevenness detection for delivery location detection, the data storage location within memory, and the relation between concentration data.

[Description of Notations]

1 Record Medium

10 Ink Tank

16 Carriage

20 Recording Head (Ink Jet Head)

21 Ink Jet Head Cartridge

100 Records Department

110 Head Driver

120 Printing / Temperature Control Section

200 Image-Processing Section

210 Charge-coupled Device (Image Sensors)

220 LOG Transducer

- 230 Masking Section
- 240 Memory
- 250 Fixed Value Storing Memory
- 260 Change-over Switch
- 270 Gamma Transducer
- 280 Head Shading Section
- 290 Binary-ized Processing Section
- A The pattern for concentration unevenness detection
- B The pattern for delivery location detection

[Translation done.]

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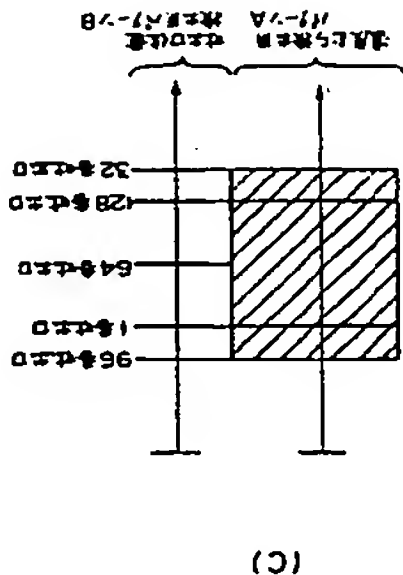
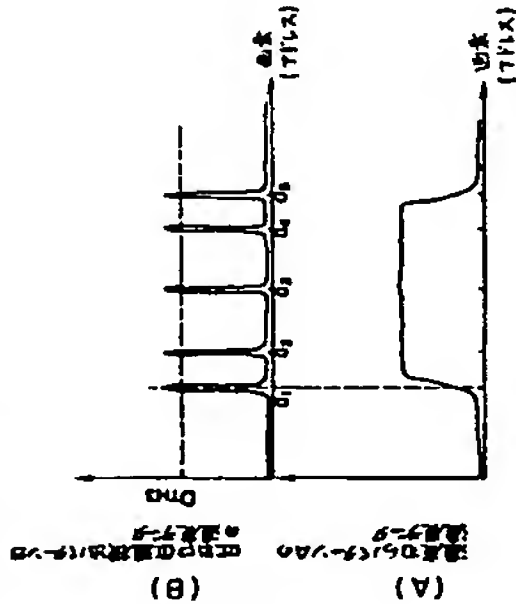
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(54)【発明の名称】 記録濃度むら補正機能を有する記録装置および記録濃度むら補正方法

(57)【要約】

【目的】 記録ヘッドの記録濃度むら検出と記録ヘッドの記録素子位置と特定とを正確に行うことができ、記録素子位置と検出濃度データとの対応を常に正しく行なうことで、ヘッドシェーディングの向上を図ること。

【構成】 記録ヘッドの記録濃度むらを検出するためのパターンAとは別に特定の記録素子だけを駆動させて印刷したパターンBを同時形成し、両方のパターンAとBを用いてヘッドシェーディングを行う。すなわち、濃度むら検出用パターンAの濃度データと各記録素子との対応を、メモリに格納した記録素子位置検出用パターンBのメモリ中の濃度データのアドレスを用いて行なう。



により、記録濃度のむらを補正する（この補正は、ヘッドシェーディング；head-shadingと呼称されている）機能を有する記録装置および濃度むらの補正方法に関するものである。

【0002】

【従来の技術】複写装置や、ワードプロセッサ、コンピュータ等の情報処理機器、さらには、通信機器の普及に伴い、それら機器の画像形成（記録）装置として、インクジェット方式や熱転写方式等による記録ヘッドを用いてデジタル画像記録を行なう装置が、急速に普及している。そのような記録装置においては、記録速度の向上のため、複数の記録素子を集積配列してなる記録ヘッドを用いるのが、一般的である。

【0003】例えば、インクジェット記録ヘッドにおいては、インク吐出口および液路を複数集積した、いわゆるマルチノズルヘッドが一般的であり、熱転写方式、感熱方式のサーマルヘッドでも複数のヒータが集積されているのが普通である。

【0004】このような記録ヘッドにおいては、その製造プロセスによる特性のばらつきやヘッド構成材料の特性ばらつき等に起因して、その複数の記録素子を特性を均一に製造するのは、困難である。その結果、かかる記録ヘッドにおいては、その各記録素子の特性にある程度のばらつきが生じる。例えば、インクジェット記録ヘッドでは、吐出口や液路等の形状にばらつきが生じ、サーマルヘッドでは、ヒータの形状や抵抗にばらつきが生じる。また、このような製造技術の限界という原因に加え

て、経年変化によっても、記録ヘッドの各記録素子間の特性にばらつきが生じる。このような記録ヘッドにおける各記録素子間の特性の不均一は、各記録素子によって記録されるドットの大きさや濃度の不均一となって現われ、結果的に、記録画像に濃度むらが生じることになる。

【0005】このような記録ヘッドにおける各記録素子の特性のばらつき（たとえば、インクジェット記録ヘッドではインク吐出量のむらに相当する）は、記録画像の品質を著しく損なうので、従来、このような特性のばらつきを補正する試みがなされている。

【0006】このような試みとして、次のような構成の記録装置が提案されている。すなわち、記録装置に記録パターンの群取部を設け、定期的に記録素子配列範囲における濃度むらを読み取って、この濃度むらデータから濃度むら補正データを作成する構成の装置である。

【0007】このような濃度むら補正方法を、記録装置としてインクジェット記録装置を例にとりて、説明する。このインクジェット記録装置の記録ヘッドは、例えば、複数の吐出口の内部に取り付けた熱電気変換素子の発熱により吐出口内のインクに気泡を形成し、この気泡発生圧力でインク滴を吐出する形式のヘッドである。このヘッドは、例えば、A3サイズの記録媒体の短辺の長

さ（29.7mm）に対応した範囲を走査可能に構成されたものがあり、このヘッドには、400dpi（ドット・パー・インチ）の密度で、前記走査の方向と直交する方向に128個の吐出口が配列されている。カラーの場合は、この構成のヘッドが4本使用され、これら4本のヘッドは、シアンヘッド、マゼンタヘッド、イエローヘッド、ブラックヘッドである。

【0008】このような記録ヘッドのインク吐出口毎の吐出むら（濃度むら）を、それぞれインク吐出口毎に補正するためには、各インク吐出口と群取系で読み取った記録濃度データとが正しく対応づけられることが前提となっている。

【0009】従来例では、まず、所定の均一な記録信号で記録ヘッドの各吐出口を駆動して、図1に示すように、記録媒体1上に濃度むら検出用のテストパターン2を形成する。このテストパターン2は、例えば、各色毎に形成する。このテストパターン2は、複数の吐出口に形成する。このテストパターン2により、図2の左側に示すように、印刷方向は左から右に、上段2a、中段2b、下段2cの3ラインを印刷することにより、形成する。このパターン2の形成方法は、原則3ライン印刷と呼ばれるもので、例えば、吐出口が128個の場合、まず、第1のライン2aは、96番目から最終の128番目までの吐出口からインクを吐出させて、印刷する。次に、第2のライン2bでは、1番目から128番目の全ての吐出口からインクを吐出させて、印刷する。最後の第3のライン2cでは、最先端の1番目の吐出口から32番目の吐出口からインクを吐出させて、印刷する。

【0010】このように、従来、ヘッドの全ての吐出口を駆動して印刷した第2のライン2bを、ヘッドの各端部の複数の吐出口を駆動して印刷した第1のライン2aおよび第3のライン2cで囲んで、テストパターン2を形成している。テストパターンが第2のライン2bのみから構成した場合、その読み取りの濃度データの両端が、パターンの両端近傍の白紙部分からの照り返しなどにより、はきりした濃度の立上りを示さず、その濃度データからヘッドの端部位置を確定しにくくなる。この欠点を回避するのが、前記原則3ライン印刷によるテストパターンの形成である。

【0011】次に、前記のように形成された、ある色のテストパターン2を、図2の左側に示すように、読み取り開始位置Sから読み取り終了位置Fまで矢印Y方向に、画像群取系で読み取り、読み取った濃度分布データを読み取った順に装置内のメモリに一時的に格納する。【0012】ところで、この従来の記録装置では、インクジェット記録系の記録密度と画像群取系の読み取り分解能は、例えば400dpi（ドット・パー・インチ）というように、同一にしている。そのため、各インク吐出口から吐出したインクのドットが、群取系の画像に

対応する。さらに、前記メモリ上の濃度データを256

の特定記録素子のアドレス位置を基に対応させる工程と、

を有することを特徴とする記録濃度むら補正データ作成方法。

【請求項18】 前記位置検出用パターン印刷に用いられる前記特定の記録素子は、一つであることを特徴とする請求項17に記載の記録濃度むら補正データ作成方法。

【請求項19】 前記位置検出用パターン印刷に用いられる前記特定の記録素子は、複数であることを特徴とする請求項17に記載の記録濃度むら補正データ作成方法。

【請求項20】 前記特定の記録素子は、前記記録ヘッドの両端の記録素子であることを特徴とする請求項17に記載の記録濃度むら補正データ作成方法。

【請求項21】 前記特定の記録素子は、さらに前記記録ヘッドの中央の記録素子を有することを特徴とする請求項20に記載の記録濃度むら補正データ作成方法。

【請求項22】 複数の記録素子を配列した記録ヘッドにより形成したパターンの濃度むらを検出して各記録素子毎の濃度データを補正する記録濃度むら補正機能を有する記録装置において、

濃度むら検出用パターンを前記複数の記録素子を用いて印刷する手段と、

前記濃度むら検出用パターンに関連づけて、記録素子の位置検出用パターンを、前記複数の記録素子の中から選定した特定の少なくとも1つの記録素子を用いて印刷する手段と、

印刷された前記濃度むら検出用パターンの濃度を検出する手段と、

印刷された前記位置検出用パターンに基づいて前記特定の記録素子の位置を認識する手段と、

認識された前記特定の記録素子の位置に基づいて、前記濃度むら検出用パターンの濃度データと前記各記録素子とを対応させる手段と、

を有することを特徴とする記録濃度むら補正機能を有する記録装置。

【請求項23】 前記対応手段によって前記各記録素子に対応された濃度データに基づいて濃度補正データを作成する手段をさらに有することを特徴とする請求項22に記載の記録装置。

【請求項24】 前記作成手段によって作成された補正データに従って、前記記録ヘッドによって記録される画像を補正する手段をさらに有することを特徴とする請求項23に記載の記録装置。

回復装置26は、記録ヘッド20の移動経路の一端に、例えばホームポジションと対向する位置に、配設されている。このヘッド回復装置26は、モータ22により伝動機構23を介して駆動され、記録ヘッド20のキャッピングを行う。このヘッド回復装置26は、キャップ部26Aを有しており、このキャップ部26Aを前記記録ヘッド20に嵌着させ、ヘッド回復装置26内に設けた適宜の吸引手段（例えば、吸引ポンプ）によって、吸引動作（吸引回復）を行なう。この吸引動作によりヘッド20の各吐出口からインクを強制的に排出させ、これによって、ヘッド20の各吐出口内に存在していた増粘インクや各吐出口の周辺の塵埃等の付着物を除去することができ、吐出回復処理が実現される。また、記録終了後などの比較的長期に記録動作を行なわない時に、前記キャップ部26Aによりヘッド20にキャッピングを施すことにより、記録ヘッド20を乾燥や塵埃の付着等から保護することができる。このような吐出回復処理は、電源投入時、記録ヘッド交換時、あるいは一定時間以上記録動作が行われない時に、行われるものである。

【0040】31は、ヘッド回復装置26の側面に配設され、シリコンゴムで形成されるワイピング部材としてのブレードである。このブレード31は、ブレード保持部材31Aにカンチレバ形状で保持されており、ヘッド回復装置26と同様、モータ22と伝動機構23とによって動作されて、記録ヘッド20の吐出面に摺接する。したがって、記録ヘッド20の記録動作時や、ヘッド回復装置26を用いた吐出回復処理後に、適切なタイミングで、ブレード31を、記録ヘッド20の移動経路中に突出させることにより、ブレード31は、移動中のヘッド20の吐出面を横断して、吐出面に付着している結露、汚れ、あるいは塵埃等の付着物を拭き取ることができる。

【0041】なお、図4では、説明の簡単化のために、インクジェットヘッドカードリッジ21が一つ取り付けられた単色の記録装置を示したが、多色カラー記録装置の場合は、キャリッジにシアン、マゼンタ、イエロー、およびブラックの4つのインクジェットヘッドカードリッジが取り付けられるだけで、基本的には、同様の構造である。

【0042】図5は、本発明を適用したインクジェット記録装置の構成系と記録系の回路構成例を示す。ここで、記録部100は、記録ヘッド20と、このヘッド20を一定の温度に加熱調整するための信号と、インクを吐出させるために吐出パルスとを、各吐出口内の加熱媒体に供給するヘッドドライバ110と、記録ヘッド20内の温度センサ（不図示）からの温度情報を得てヘッド20を所定の温度に維持するようにヘッドドライバ110から出力する温度調整信号および吐出パルスのパルス幅を調整する印刷／温度調整制御部120とからなっている。制御部120では、印刷区間の制御を印刷色毎に

なる。

【0047】図7のグラフ(B)に示すように、吐出口位置検出用パターンBを読み取ってメモリ240上に格納した濃度データを、そのメモリ240上のアドレスの低位の方から検索して行く。そして、所定の閾値レベルD_{TH}を超える濃度データが格納されているアドレスを、さらにメモリ240に記憶させる。このようにして記憶させたアドレスa1～a5は、低位から順に、96番吐出口、1番吐出口、64番吐出口、128番吐出口、32番吐出口の濃度データに対応する。

【0048】次に、濃度むら検出用パターンAをイメージセンサ210から読み取ってメモリ240上に格納した濃度データのうち、すでに記憶してある前記1番吐出口のアドレスa2と同一アドレスの濃度データを、濃度むら検出用パターンAの1番吐出口の濃度データとして採用する。

【0049】前記吐出口位置検出用パターンBは、特定の吐出口のみを吐出させて形成したもので、近接した吐出口の吐出インクの影響を受けないで、形成され、しかも、濃度むら検出用パターンAのように、50%濃度のハーフトーンではなく、ヘッドドライバ110を直接制御して吐出させているので、吐出濃度が比較的高く、印刷濃度が高い。したがって、パターンBの濃度データに対しては、ピーク位置、すなわち吐出口位置を同一にするための閾値を高く設定でき、濃度データの傾斜部分を避けることができ、正確な位置の特定が可能となる。

【0050】また、パターンBでは、5つの吐出口を使っている中で、もしいづれかの吐出口が不吐出であったとしても、残りの吐出口の濃度データの格納されているアドレスから1番吐出口のデータの格納されているアドレスを容易に計算で求めることができ、インク不吐出にも対処できる。なお、特定吐出口の不吐出を考慮に入れないければ、少なくとも一つの吐出口を特定吐出口とすれば、吐出口位置検出用パターンとしては充分である。上記ヘッドシェーディング処理における対応づけが終了した後、むら補正用のデータ(HSデータ)を演算して、ヘッドシェーディング処理が終了する。この後、演算されたHSデータに基づいて、画像情報または駆動信号が補正され、濃度むらのない画像が記録される。

【0051】次に、上述したヘッドシェーディング処理の詳細について、図8～11のプロローチャートおよび図12のグラフを参照して説明する。

【0052】図8は、ヘッドシェーディングのジェネラルフローチャートである。Step1で濃度むら検出用テストパターンと本実施例の特徴をなす吐出口位置検出用パターンを印刷する。Step2では、印刷したパターンを読み取って、濃度データと吐出口との対応づけを行ない、Step3でHSデータを演算する。この後、通常の記録動作において、上記HSデータに基づいて濃

度むらをなくした画像を記録ヘッドによって記録する。

【0053】図9は、Step1の詳細を示すパターン印刷ルーチンのフローチャートである。Step1で濃度むら検出用パターン（図6、図7、図12）を印刷し、Step12で吐出口位置検出用パターン（図6、図7、図12）を印刷する。Step13、14において、これらを4色分、4パターン分繰り返すことで、図6に示すパターン印刷が完了する。

【0054】図10は、Step2の詳細を示すパターン読み取りルーチンのフローチャートである。Step21において、吐出口位置検出用パターンB（図12（1））を読み取り、濃度データとしてメモリに格納する（図12（2）、（3））。Step22で、この処理を4パターン分繰り返す。上述のように、濃度データは、特定の吐出口に対応して5つのピークを示す。

【0055】Step23、24では、特定の吐出口のメモリ上のアドレスを4パターン分検索し、検出したアドレスをStep25でメモリに格納する（図12（4））。特定の吐出口は、閾値D_{TH}を超える濃度データが格納されるアドレスとして検出される。

【0056】次に、Step26、27で濃度むら検出用パターンAを4パターン分読み取ってメモリに格納する（図12（5））。以上の処理を、Step28で4色分繰り返して読み取り、ルーチンを終了する。

【0057】図11は、Step3の詳細を示すHSデータ演算ルーチンのフローチャートである。Step31では、Step25で格納した特定吐出口のメモリ上のアドレスから、Step26で濃度むら検出用パターンを読み取って、格納したデータのメモリ上の有効領域を決定する（図12（6））。これにより、濃度データと各吐出口との対応づけがなされる。

【0058】Step32では、有効領域の濃度むら検出用パターン濃度データを用いて、HSデータを演算する。Step33、34で上記処理を4パターン分、4色分繰り返して演算ルーチンを終了する。ここで、1色当り4パターン分のHSデータを演算するが、濃度むら補正に使用するHSデータとしては、これらを平均してもよいし、最頻値を採用してもよい。

【0059】上述のヘッドシェーディング処理によれば、濃度むら検出用パターン濃度データと各吐出口との対応が正確に行なわれるので、適切な濃度むら補正データ(HSデータ)を演算することができる。その結果、濃度むらのない画像を記録することが可能となる。

【0060】なお、本発明は、インクジェット記録に限定されるものではなく、熱転写記録、感熱記録等にも適用できる。

【0061】（その他）なお、本発明は、特にインクジェット記録方式の中でも、インク吐出を行わせるために利用されるエネルギーとして熱エネルギーを発生する手段（例えば電気熱変換体やレーザ光等）を備え、前記熱エ

ネルギによりインクの状態変化を生起させる方式の記録ヘッド、記録装置において優れた効果をもたらすものである。かかる方式によれば記録の高密度化、高精細化が達成できるからである。

【0062】その代表的な構成や原理については、例えば、米国特許第4723129号明細書、同第4740796号明細書に開示されている基本的な原理を用いて行うものが好ましい。この方式は所謂オンデマンド型、コンティニュアス型のいずれにも適用可能であるが、特に、オンデマンド型の場合には、液体（インク）が保持されているシートや液路に対応して配置されている電気熱変換体に、記録情報に対応していて後沸騰を越える急速な温度上昇を与える少なくとも1つの駆動信号を印加することによって、電気熱変換体に熱エネルギーを発生せしめ、記録ヘッドの熱作用面に膜沸騰を生じさせて、結果的にこの駆動信号に一对一で対応した液体（インク）内の気泡を形成できるので有効である。この気泡の成長、収縮により吐出用開口を介して液体（インク）を吐出させて、少なくとも1つの滴を形成する。この駆動信号をパルス形状とすると、即時通切に気泡の成長収縮が行われるので、特に応答性に優れた液体（インク）の吐出が達成でき、より好ましい。このパルス形状の駆動信号としては、米国特許第4463359号明細書、同第4345262号明細書に記載されているようなものがある。なお、上記熱作用面に記載されているようなものがある。米国特許第4313124号明細書に記載されている条件を採用すると、さらに優れた記録を行うことができる。

【0063】記録ヘッドの構成としては、上述の各明細書に開示されているような吐出口、液路、電気熱変換体の組合せ構成（直線状液流路または直角液流路）の他に、熱作用部が屈曲する領域に配置されている構成を開示する。米国特許第4583333号明細書、米国特許第459600号明細書を用いた構成も本発明に含まれるものである。加えて、複数の電気熱変換体に対して、共通するスリットを電気熱変換体の吐出部とする構成を開示する。特開昭59-123670号公報や熱エネルギーの圧力波を吸収する開口を吐出部に対応させる構成を開示する。特開昭59-138461号公報に基いた構成としても本発明の効果は有効である。すなわち、記録ヘッドの形態がどのようなものであっても、本発明によれば記録を確実に効率よく行うことができるようになるからである。

【0064】さらに、記録装置が記録できる記録媒体の最大幅に対応した長さを有するフルラインタイプの記録ヘッドに対しても本発明は有効に適用できる。そのような記録ヘッドとしては、複数の記録ヘッドの組合せによってその長さを満たす構成や、一体的に形成された1個の記録ヘッドとしての構成のいずれでもよい。

【0065】加えて、上例のようなシリアルタイプのもの

のでも、装置本体に固定された記録ヘッド、あるいは装置本体に装着されることで装置本体との電気的な接続や装置本体からのインクの供給が可能になる交換自在のチップタイプの記録ヘッド、あるいは記録ヘッド自体に一体的にインクタンクが設けられたカートリッジタイプの記録ヘッドを用いた場合にも本発明は有効である。

【0066】また、本発明の記録装置の構成として、記録ヘッドの吐出回復手段、予備的な補助手段等を付加することは本発明の効果を一層安定できるので、好ましいものである。これらを具体的に挙げれば、記録ヘッドに対するキャッピング手段、クリーニング手段、加圧或は吸引手段、電気熱変換体或はこれとは別の加熱素子或はこれらの組み合わせを用いて加熱を行う予備加熱手段、記録とは別の吐出を行なう予備吐出手段を挙げることができる。

【0067】また、搭載される記録ヘッドの種類ないし個数についても、例えば単色のインクに対応して1個のみのヘッドが設けられたもの、他、記録色や濃度を異にする複数のインクに対応して複数個数設けられるものであってもよい。すなわち、例えば記録装置の記録モードとしては黒色等の主流色のみの記録モードだけではなく、記ヘッドを一体的に構成するが複数個の組み合わせによるかいずれでもよいが、異なる色の複色カラー、または複色によるフルカラーの各記録モードの少なくとも一つを備えた装置にも本発明は極めて有効である。

【0068】さらに加えて、以上説明した本発明実施例においては、インクを液体として説明しているが、室温やそれ以下で固化するインクであって、室温で軟化もしくは液化するものを用いてもよく、あるいはインクジェット方式ではインク自体を30℃以上70℃以下の範囲内で温度調整を行ってインクの粘性を安定吐出範囲にあるように温度制御するものが一般的であるから、使用記録値付与時にインクが液状をなすものを用いてもよい。加えて、熱エネルギーによる昇温を、インクの固形状態から液体状態への状態変化のエネルギーとして使用せしめることで環境的に防止するため、またはインクの蒸発を防止するため、放置状態で固化し加熱によって液化するインクを用いてもよい。いずれにしても熱エネルギーの記録値号に応じた付与によってインクが液化し、液状インクが吐出されるものや、記録媒体に到達する時点ですでに固化し始めるもの等のような、熱エネルギーの付与によって初めて液化する性質のインクを使用する場合も本発明は適用可能である。このような場合のインクは、特開昭54-56847号公報あるいは特開昭60-71260号公報に記載されるような、多孔質シート四部または貫通孔に液状又は固形物として保持された状態で、電気熱変換体に対して対向するような形態としてもよい。本発明においては、上述した各インクに対して最も有効なものは、上述した膜沸騰方式を実行するものである。

【0069】さらに加えて、本発明インクジェット記録装置の形態としては、コンピュータ等の情報処理機器の画像出力端末として用いられるもの、他、リーダ等と組合せた複写装置、さらには送受信機能を有するフランクミリ装置の形態を採るもの等であってもよい。

【0070】

【発明の効果】以上説明したように、本発明によれば、記録ヘッドの記録素子位置の特定のための専用のパターンを印刷し、印刷されたこのパターンを読み取って得た濃度データが格納されたメモリ上のアドレスを記憶しておき、次に濃度むら検出用パターンを読み取って得た濃度データの記録素子番号を先に記憶しておいたアドレスを用いることにより対応させるようにしたので、濃度むら検出と記録素子位置の特定が正確に行うことができる。よって、本発明によれば、ヘッドシェーディングの性能を高め、その補正の収束性を向上させることができるという効果が得られる。

【図面の簡単な説明】

【図1】従来例の濃度むら検出用パターンを印刷したテストチャートである。

【図2】図1の検出用パターンの読取方向を示す説明図と、読み取った濃度データのレベルとメモリ上のアドレスとの関係を示すグラフである。

【図3】本発明を適用したインクジェット記録装置の記録ヘッドの構成例を示す斜視図である。

【図4】図3の記録ヘッドを具えたインクジェット記録装置の要部の内部構成例を示す斜視図である。

【図5】本発明を適用したインクジェット記録装置の読取系と記録系の回路構成例を示すブロック図である。

【図6】本発明の一実施例の濃度むら検出用パターンと吐出口位置検出用パターンとを印刷したテストチャートである。

【図7】図6の検出用パターンの読取方向を示す平面図（C）および読み取った濃度むらパターンの濃度データのレベル、また読み取った吐出口位置パターンの濃度データのレベルとメモリ上のアドレスとの関係をそれぞれ示すグラフ（A）（B）である。

【図8】本発明により行なわれるヘッドシェーディングの概略フローチャートである。

【図9】本発明により行なわれるヘッドシェーディングにおけるテストパターン印刷ルーチンを示すフローチャートである。

【図10】本発明により行なわれるヘッドシェーディングにおけるテストパターン読み取りルーチンを示すフローチャートである。

【図11】本発明により行なわれるヘッドシェーディングにおけるテストパターン読み取り濃度データから補正データを作成するルーチンを示すフローチャートである。

【図12】本発明の原理を説明するグラフであり、吐出口位置検出用パターン／濃度むら検出用パターンの物理的位置、メモリ内のデータ格納位置、濃度データ間の関係を示すグラフである。

【符号の説明】

1 記録媒体

10 インクタンク

16 キャリッジ

20 記録ヘッド（インクジェットヘッド）

21 インクジェットヘッドカートリッジ

100 記録部

110 ヘッドドライバ

120 印字／温度制御部

200 画像処理部

210 電荷結合素子（イメージセンサ）

220 LOG変換部

230 マスキング部

240 メモリ

250 固定値格納メモリ

260 切換スイッチ

270 γ変換部

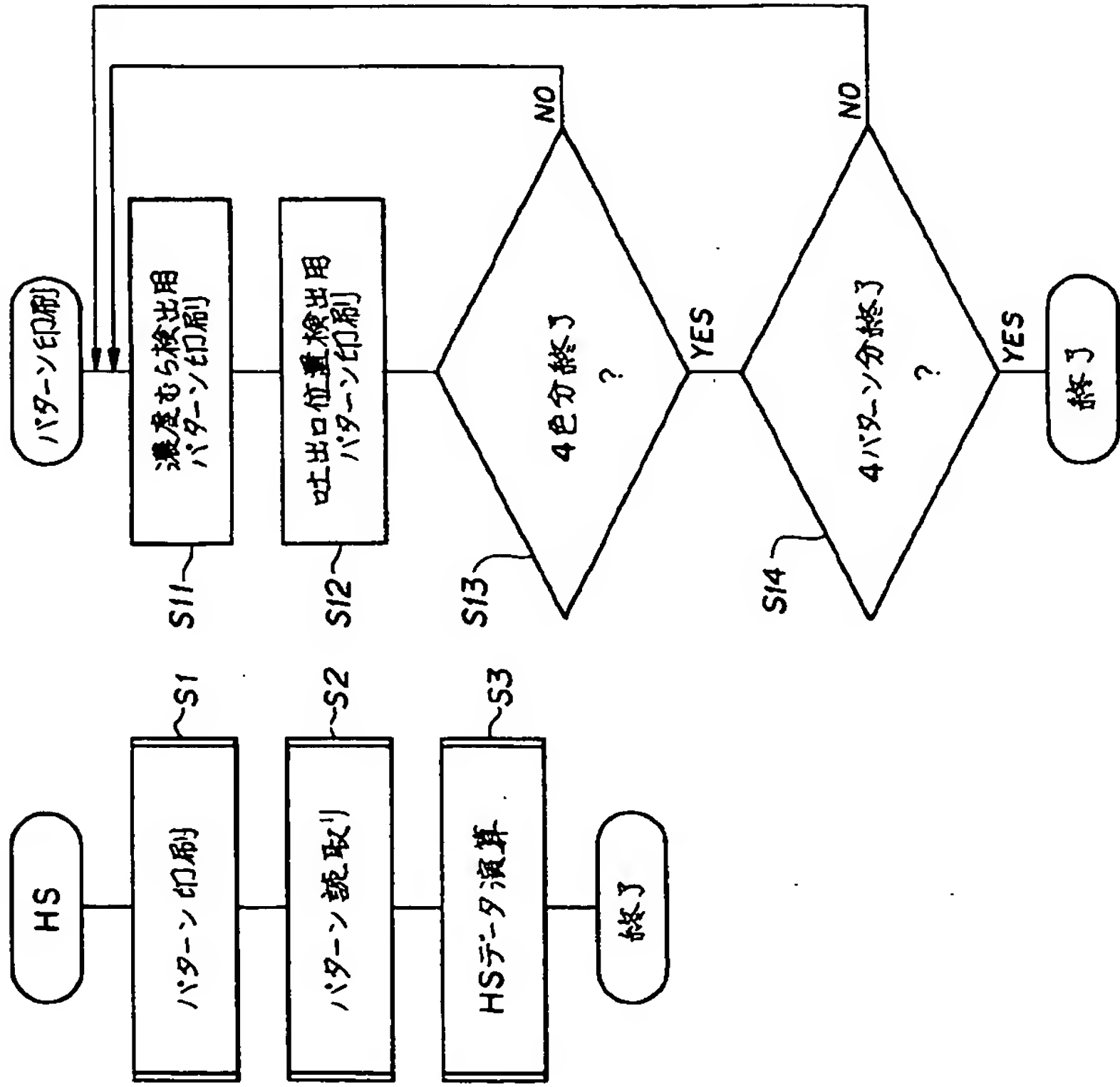
280 ヘッドシェーディング部

290 2値化処理部

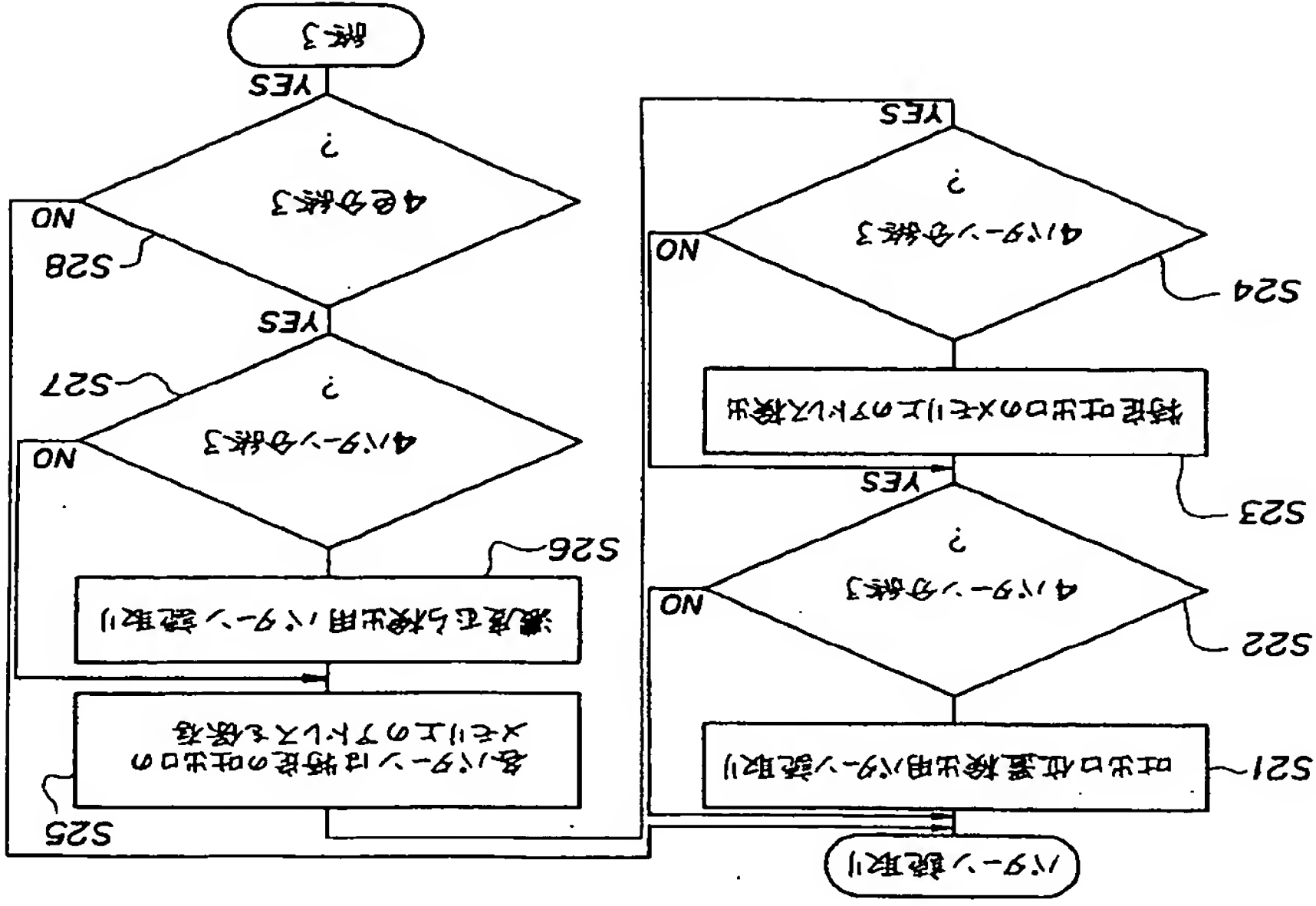
A 濃度むら検出用パターン

B 吐出口位置検出用パターン

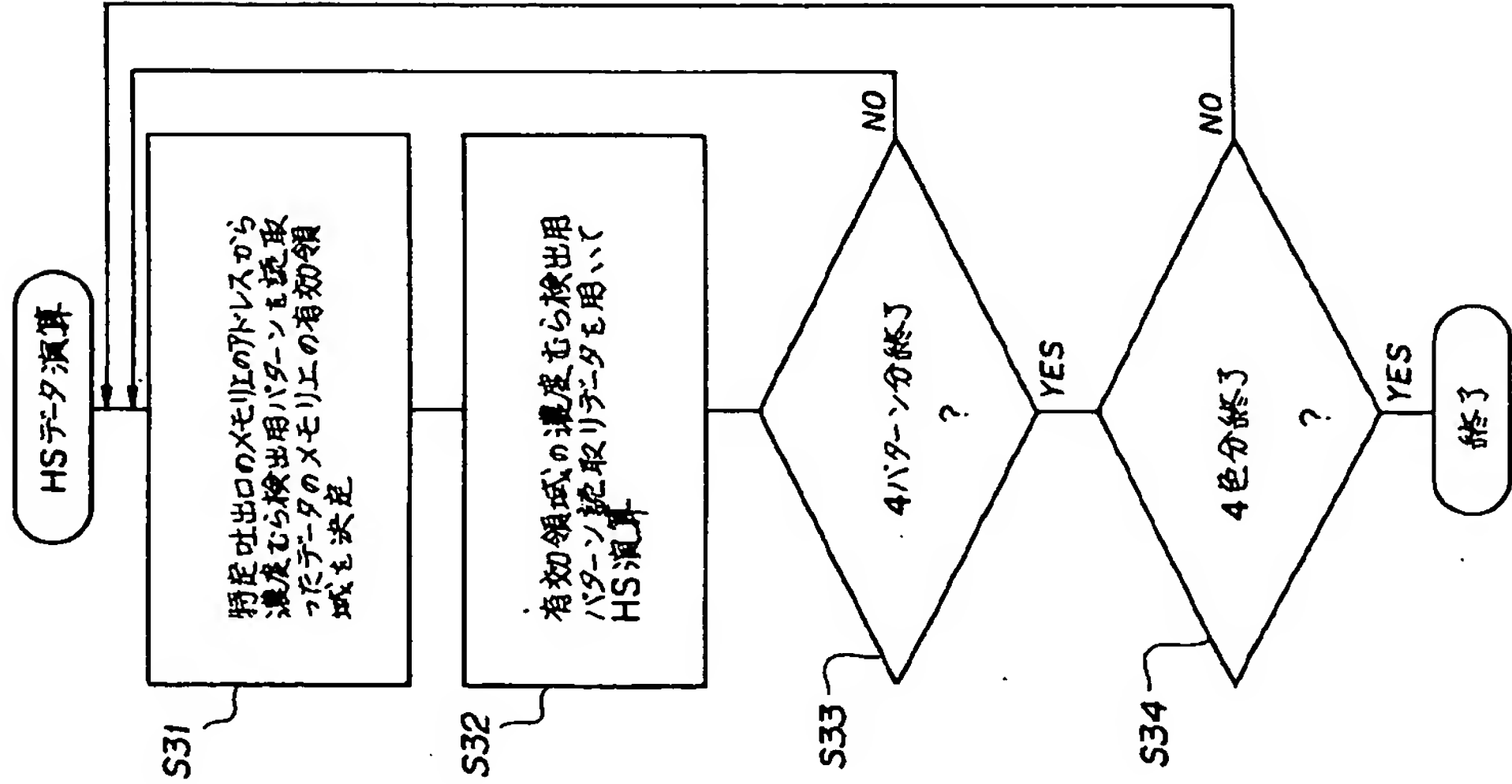
【図8】



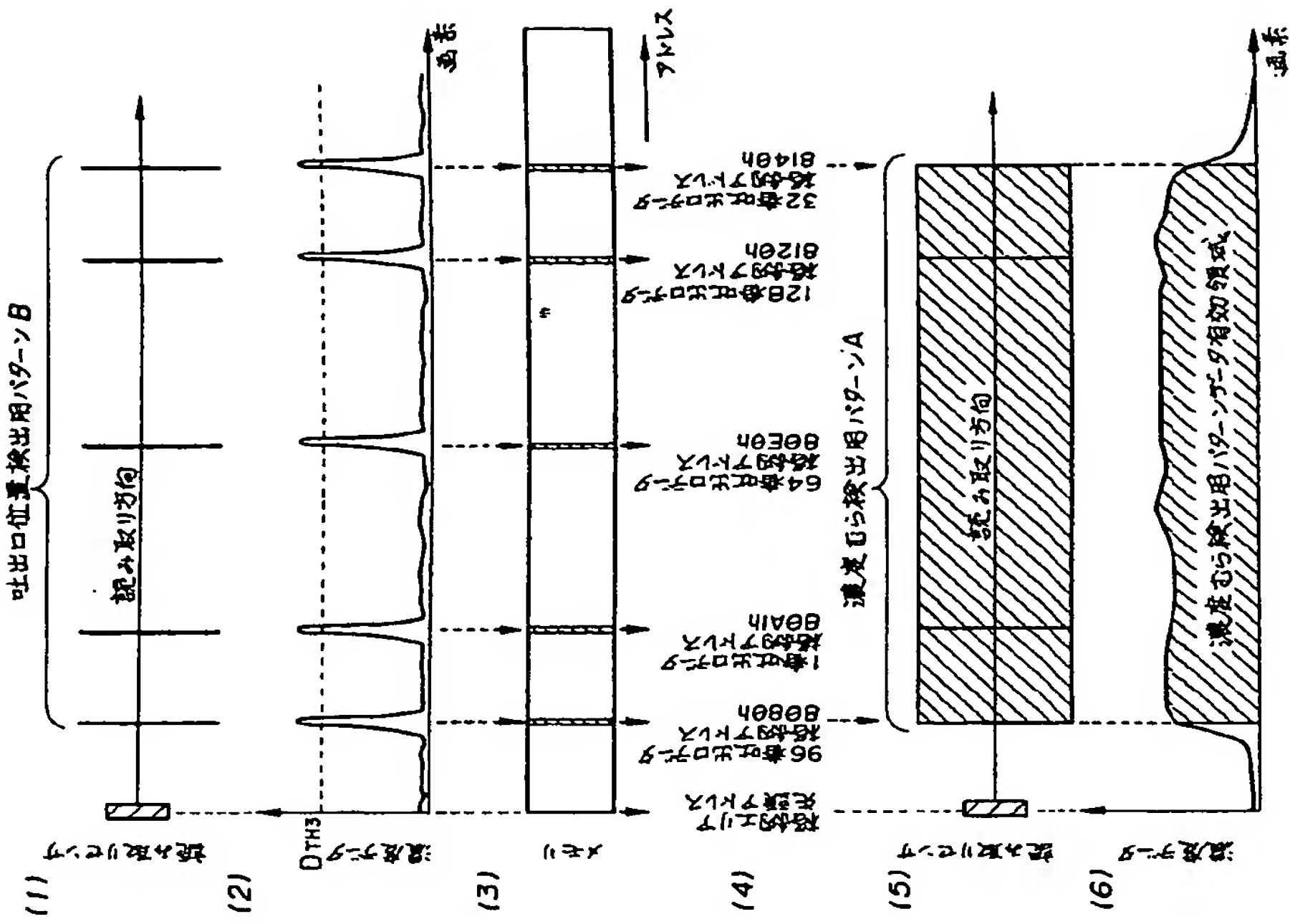
【図9】



【図11】



【図12】



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